

REMARKS

Amendments to the Claims

Claims 1-13 were pending.

Claims 1, 2, 5, 6 and 8-10 have been amended.

Claims 1, 2, 5, 6 and 8-10 have been amended to better clarify the invention.

Specifically, Claim 1 has been amended to move the phrase “wherein the first cavity is connected to the second cavity by an intermediate cavity to the preamble.

Claims 1, 5, 6 and 8-10 have been further amended to reflect that the connection medium is delivered into the intermediate cavity “through one or more channels connected to the intermediate cavity.” Support for this amendment can be found in the Specification, for example, at page 8, lines 21-23; page 10, lines 10-18; and Fig. 2.

Claim 2 has been amended to recite “at least” to better clarify the invention.

Claim 5 has been amended to recite “the connection medium is miscible with the one or more liquid substances whose transfer is to be controlled.” Support for this amendment can be found in the Specification, for example, at page 10, line 31 through page 11, line 4; page 18, lines 7-14.

No new matter has been added. Entry of these amendments is respectfully requested.

Telephonic Interview

Applicants would like to thank Examiner Olsen for the time spent with Applicants’ representatives David E. Brook and Hak J. Chang on July 23, 2010 with respect Claims 1 and 6. During the telephone interview, the participants discussed the teachings of Brown and the scope of Claims 1 and 6. The differences between the teachings of Brown and the claimed invention were discussed. Examiner Olsen alleged that Claims 1 and 6 read on the teachings of Brown. The participants discussed potential claim amendments which would better clarify the claimed invention over the teachings of Brown. The amendments are reflected in this response.

Rejection of Claims 1, 2, 6 and 7 Under 35 U.S.C. § 102(b)

Claims 1, 2, 6 and 7 stand rejected as being anticipated by Brown (U.S. Patent No. 4,676,274). The Examiner broadly interpreted the principal fluid in Brown as both connection medium and substance whose movement is being controlled. The movement of the principal fluid in Brown was considered in the Office Action as simultaneous “introduction of a connection medium” and “movement of the substance.”

While Applicants disagree and maintain the arguments presented in the previous response, in the interest of furthering prosecution, Applicants have now amended independent Claims 1 and 6 to recite “one or more channels connected to the intermediate cavity” for introducing or delivering the connection medium into the intermediate cavity. This amendment to Claims 1 and 6 renders the rejection moot against these claims. Claims 1 and 6, as amended, require the connection medium be delivered through the one or more channels, which are separate embodiments from the first or the second cavity.

Brown teaches methods of controlling capillary flow of a principal fluid (*see Abstract; emphasis added*). There are only two types of fluids involved in Brown’s device and method, the controlling fluid (“air”) and the principal fluid whose transfer is being controlled. The movement of the principal fluid is controlled by placing the controlling fluid (e.g., the separation medium) in and out of the intermediate cavity. The movement of the principal fluid is achieved by differential capillary forces created by the differences in the surface energy between the surface material of the first cavity and that of the intermediate cavity.

Brown does not disclose one or more channels connected to the intermediate cavity, which are specifically designated for delivering the connection medium into the intermediate cavity. In the present invention, such a channel is distinct from the first, second or intermediate cavity (*see Fig. 2*). Further, Brown’s device does not employ a connection medium that is separately delivered into the intermediate cavity because the connection medium and the principal substance whose movement is being controlled are the same and therefore “introduction of a connection medium” and the “movement of the substance” occurs simultaneously in Brown. In the present invention, active replacement of a separation medium with a connection medium through one or more separate channels other than the first and second cavities is involved and the connection medium is separately introduced into the intermediate cavity via the one or more channels.

For at least the reasons set forth above, Claims 1 and 6, as amended, and Claims 2 and 7 dependent from Claims 1 and 6 are not anticipated by the teachings of Brown.

Rejection of Claims 1-13 Under 35 U.S.C. § 103(a)

Claims 1-13 have been rejected under U.S.C. § 103(a) as being unpatentable over Lee *et al.* (U.S. 2002/0170825; hereinafter, “Lee”) in view of Brown and with or without either Sundberg *et al.* (U.S. Patent No. 6,090,251; hereinafter, “Sundberg”) or Hochstrasser (U.S. Patent 4,874,490; hereinafter, “Hochstrasser”). The Office Action stated that: “Lee discloses all the limitations of the first cavity 3, second cavity 4, but does not explicitly teach the presence of intermediate cavity that connects the first and second cavities... The previously discussed Brown teaches the use of intermediate cavities between two different cavities (*i.e.*, capillary channels) for controlling the fluid flow from one cavity to the other... It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize an intermediate cavity between the two cavities is controlled until suitable transfer between the channels is so desire” (Office Action at page 4).

While Applicants disagree and maintain the arguments presented in the previous response, in the interest of furthering prosecution, Applicants have now amended independent Claims 1, 6, 8 and 10 to recite “one or more channels connected to the intermediate cavity” for introducing or delivering the connection medium into the intermediate cavity, rendering the rejection moot. Independent Claims 1, 6, 8 and 10, as amended, require the connection medium be delivered through the one or more channels, which are separate elements from the first or the second cavity. Applicants assert that Claims 1-13 are not rendered obvious over the combined teachings of the cited reference for at least the following reasons.

Teachings of the Cited References

Lee

Lee teaches a method and a device for two-dimensional electrophoresis. In Lee, samples are transferred from the first dimension cavities to the second dimension cavities by changing electric potential. Lee teaches how to fill the first cavity and the second cavity with two different media.

Brown

The teachings and the deficiencies of Brown are discussed in detail above.

Sundberg

Sundberg teaches an intermediate “region” (*i.e.*, “limit region 90”) designated to keep the first fluid in the first cavity from “wicking” into the second fluid. Sundberg’ intermediate region has a significantly smaller cross-sectional dimension from the adjacent channels in order to create a differential capillary force between the first cavity and the second cavity. It is this capillary force that prevents the first fluid “wicking” into the second fluid in Sundberg.

Hochstrasser

Hochstrasser teaches a system for two-dimensional gel electrophoresis, using two gels (*i.e.*, “strip gel” and “slab gel”) separated by an insulating (“separation medium”) layer that can be solid, liquid or gas (col. 2, lines 22-39). According to the teachings of Hochstrasser exemplified in Figure 3, the strip gel and the slab gel are separated by a space occupied by air. Once the desired separation is achieved in the first dimension, the two gels are placed in electrical contact for transfer from one gel to the other (col. 5, lines 3-24) either by: (1) pushing the first gel (“the strip gel”) until it physically comes into contact with the second gel (“the slab gel”) (*see*, col. 5, lines 25-30); or (2) introducing a new gel between the first gel and the second gel (*see*, col. 5, lines 31-44).

Combined Teachings of Lee and Brown Do Not Teach or Suggest the Present Invention

The combined teachings of Lee and Brown do not teach or suggest the use of a connection medium or a method of replacing a separation medium with a connection medium through one or more channels designated for delivering the connection medium into the intermediate cavity to facilitate the transfer from the first cavity to the second cavity.

Lee is entirely silent on any aspects relating to an intermediate cavity, separation medium, connection medium or replacement of the separation medium with the connection medium to allow transfer of the substance from the first cavity to the second cavity.

Brown’s approach of controlling the movement of the principal fluid is fundamentally different from the present invention. The movement of the principal fluid is controlled by

placing one type controlling fluid (e.g., the separation medium of air) in and out of the intermediate cavity. The movement of the principal fluid is achieved by differential capillary forces created by the differences in the surface energy between the surface material of the first cavity and that of the intermediate cavity. As such, Brown device does not use a connection medium or channels connected to the intermediate cavity for delivering the connection medium. It is noted that the movement of the principal fluid in Brown is broadly construed by the Examiner as the introduction of the connection medium into the intermediate cavity.

In contrast, the present invention utilizes active replacement of a gaseous or liquid separation medium in the intermediate cavity with a liquid connection medium *separately delivered through one or more channels connected to the intermediate cavity*. In the present invention, the delivery of the liquid connection medium through the channels into the intermediate cavity allows the transfer.

Therefore, the combined teachings of Lee and Brown do not teach or suggest all elements of the present invention.

One of Ordinary Skill in the Art Would Not Have Been Motivated to Arrive At the Present Invention

One of ordinary skill in the art would not have been motivated to combine the teachings of Lee with the teachings of Brown to arrive at the present invention because Brown' approach in controlling the movement of the principal fluid is fundamentally different from that of the present invention. Brown uses the force created by the differences in the surface energy between the first cavity and the intermediate cavity. In the present invention, however, the movement is facilitated by replacing a gaseous or liquid separation medium with a liquid connection medium. It is the composition of the connection medium in the present invention that facilitates the movement of the substance. In contrast, it is the composition of the surface materials in the cavities that controls the movement in Brown. For example, in Brown, if the surface materials of all cavities are same, the principal fluid would not move even after the pressurized air is vented. The distinction between the present invention and the device in Brown becomes more evident with the present claim amendments to independent Claims 1, 6, 8 and 10 that require the use of one or more channels for delivering the connection medium into the intermediate cavity.

Because of this fundamental distinctions between the present invention and the teachings of Brown, one of ordinary skill in the art would not have been motivated to combine the teachings of Lee with the teachings of Brown to arrive at the present invention.

Combined Teachings of Lee, Brown, Sundberg, Hochstrasser Do Not Render the Present Invention Obvious

To achieve separation between the first and second cavities, Lee places a membrane barrier between the top substrate and the bottom substrate (*see* Lee, Fig.10). Sundberg employs an intermediate region whose cross section dimension is significantly smaller than the first or the second cavity to create capillary force. In Hochstrasser, the strip gel and the slab gel are separated by the space occupied by air and the movement is enabled by mechanical contact or insertion of an electroconductive solid layer. Brown utilizes removal of pressurized air in the intermediate cavity and the surface energy between the cavities.

Applicants assert that the issue is *not* whether one of ordinary skill in the art would have been motivated to achieve separate fillings of two cavities (*see* the Office Action at page 4). In the field of the two dimensional electrophoresis, two different environments are needed and created by separate filling of two cavities with two different media. Various means to achieve such separation have been provided in the field as noted above.

In determining obviousness, however, the issue is whether or not one of ordinary skill in the art would have been motivated to achieve the controlled movement of the substance that Applicants have provided in the Specification, for example, the use of a liquid connection medium delivered into the intermediate cavity through one or more channels to the intermediate cavity.

Applicants assert that none of the cited references teaches or suggests a method of controlling transfer that involves the replacement of a gaseous or liquid separation medium with a liquid connection medium separately delivered through one or more channels connected to the intermediate cavity, wherein the delivery of the liquid connection medium into the intermediate cavity allows the transfer.

Nor one of ordinary skill in the art would have been motivated to combine the teachings of Lee, Brown, Sundberg and Hochstrasser to arrive at the present invention. The cited references

teach various methods for separating two cavities or electrophoretic environments. However, none of the cited references teaches or suggests how to enable the movement of the substances as taught in the present application (*e.g.*, the use of the liquid connection medium in the intermediate cavity *via* a designated channel(s)). Lee is entirely silent on any aspect relating to an intermediate cavity. Brown's device does not utilize a connection medium or one or more channels connected to the intermediate cavity for delivering the connection medium. Sundberg employs an intermediate region with a smaller cross sectional dimension and does not utilize any separation or connection medium. In Hochstrasser, the movement is achieved by mechanical contact or insertion of an electroconductive solid layer.

The Office Action appears to focus on how to achieve the separation of the first cavity from the second cavity. As noted above, the issue is whether or not one of ordinary skill in the art would have motivated to arrive at the present invention, which is to control the movement of the substance from the first cavity to the second cavity. Applicants assert that the approach taken by Applicants in achieving the controlled movement is not taught for suggested by the combined teachings of Lee, Brown, Sundberg and Hochstrasser and that one of ordinary skill in the art would not have been motivated to combine the teachings of the cited reference to arrive at the present invention due to the fundamental differences in the problem-solution approaches between the present invention and the cited references.

Rejection of Claims 11-13 Under 35 U.S.C. § 103(a)

Claims 11-13 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Brown in view of Sundberg. With respect to Claims 11-13, the Office Action asserted that: "Brown set forth all the limitations of the claims and suggested that the various channels of its device are capillary channels which would be suggestive of micrometer scaled channels...Sundberg teaches an alternative device for controlling fluid movement through capillary channels and teaches the use of channel dimensions overlapping the claimed dimension...It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the dimensions of Sundberg for the unspecified capillary dimensions of Brown..." (the Office Action at page 9).

With respect to Claim 13, the Office Action asserted that: "It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of Sundberg for the device of Brown because electrokinetics is a well established means for moving fluid through capillary channels." (the Office Action at page 10)

While Applicants disagree, Applicants have now amended independent Claim 6 to recite "one or more channels connected to the intermediate cavity" for delivering the connection medium into the intermediate cavity. The amendment to independent Claim 6 renders the rejection moot because Claims 11-13 are dependent on independent Claim 6. Claim 6, as amended, now requires the connection medium be delivered through the one or more channels, which are separate elements from the first and the second cavities. Neither Brown nor Sundberg teaches or suggests the use of the channels set forth in Claim 6. Therefore, Claims 11-13 are not rendered obvious over Brown in view of Sundberg.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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